



THE CHINESE UNIVERSITY OF HONG KONG
Department of Electronic Engineering
Seminar



**Physical Heuristics of Micro-Modeling Circuit (MMC) for
Emerging Passive Device Design**

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Place: Rm 222, Ho Sin Hang Engineering Building, CUHK

Abstract

Micro-modeling circuit (MMC) is the only physical meaningful method that converts a general electromagnetic (EM) problem into a concise RLC circuit with correspondence to the layout. The unique merit of MMC can provide a deep physical heuristic on the passive devices and inspire new design methods. The MMC is first utilized to explain the nature of radiation of an electrically small antenna that largely depends on antenna geometry. It is theoretically discovered and experimentally validated for the first time that the radiation efficiency decisively depends on mutual radiated power associated with partial segments of the antenna. A circuitual figure of merit and the graphical representation are also proposed for illustrating the correspondence of the mutual radiated power and the antenna structure. With the physical intuitive method, the radiation efficiency of a loop antenna is improved from 57% to 91%. Second, the MMC circuit is also able to reveal the working mechanism of antennas with external lumped elements and improve the design. A new method using the lumped LC to manipulate the characteristic mode for 5G wireless terminal antennas is proposed, which can improve the 6 dB return loss bandwidth by more than 12% and total efficiency from 40% to 80%. More importantly, for the emerging integrated passive devices (IPD) of micro/nano scale, the increasing significant parasitic effect is a crucial issue. The MMC can be an effective tool to evaluate the mutual inductive and capacitive couplings between structures and figure out the working mechanism.

Biography

Yuhang Dou (Member, IEEE) received the B.S. degree from the Nanjing University of Science and Technology, Nanjing, China, in 2012, and the Ph.D. degree from The Chinese University of Hong Kong, Hong Kong, in 2019. She was a Post-Doctoral Fellow with the School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN, USA. In December 2022, she joined Xiamen University, Xiamen, China, as an Associate Professor with the School of Electronic Science and Engineering.

Her research interests include fast signal integrity analysis of large-scale nonlinear circuits and systems, minimal order model of large-scale electromagnetic problems, physics-based circuit-domain modeling methods for radiation and high-speed microwave problems, parallel computing, and integrated passive device (IPD) design.

Dr. Dou was a recipient of the First Runner Up Awards of the IEEE Hong Kong AP/MTT Postgraduate Conference in 2015 and 2018, and of the Second Runner Up Awards in 2016. She was also recipient of an Honorable Mention Award from the 2015 IEEE NEMO Conference.

***** ALL ARE WELCOME *****

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